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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/749,256	12/31/2003	Tushar Udeshi	34003.100	8558

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HAYNES AND BOONE, LLP
901 MAIN STREET, SUITE 3100
DALLAS, TX 75202

EXAMINER	
ROSE, HELENE ROBERTA	

ART UNIT	PAPER NUMBER
2163	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/749,256	UDESHI ET AL.
	Examiner	Art Unit
	Helene Rose	2163

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/16/05 & 2/6/04*. 5/16/05

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Detailed Action

1. Claims 1- 51 have been presented for examination.

2. Claims 1-51 have been rejected.

Information Disclosure Statement

3. The information disclosure statements (IDS) submitted on ***2/6/2004*** and ***9/16/2005***, accordingly, the information disclosure statement has been considered by the examiner. However, the information disclosure statement submitted on ***5/16/2005***, the non-patent literature documents have been considered by the Examiner, but the U.S. Publication Document No. 2002027563, has not been considered, because the Examiner believes that the "document number" is incorrectly cited because the US Publication was not able located the Publication in order for it to be considered. Appropriate correction is required

Claim Rejections – 35 U.S.C – 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-6, 8-17,19-27, 29-38, 43-47, and 51 are rejected under 35 U.S.C. 102(b) as being anticipated by Wilhelms et al (Non-Patent Literature, Octrees for Faster Isosurface Generation - ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, hereinafter Wilhelms).

Claims 1, 20, 26 and 30:

Regarding Claims 1, 20, 26 and 30 discloses a method and processing system utilizing the same functionality, Wilhelms teaches a method of rendering isosurface data, comprising:

providing hierarchical node data representing an object having an isosurface (page 209, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, wherein Figure 1 is defined and section 1.1, wherein octrees have been used to represent three-dimensional objects, Wilhelms), the hierarchical node data including a lowest hierarchy level having a plurality of leaf nodes (page 209, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, wherein Figure 1 is defined and section 1.1, wherein giving lower half space, Wilhelms) and a plurality of higher hierarchy levels each having a plurality of non-leaf nodes each encompassing ones of the plurality of leaf nodes (page 209, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, wherein Figure 1 is defined, wherein node deph indicates higher, nodes and so forth, and see first paragraph, wherein the node is a leaf and it points to data, Wilhelms);

determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface (page 209, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, regions are divided four or eight time and page 205, section 2, second paragraph, wherein representing the portion of the isosurface within that cell, Wilhelms), each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes (page 209, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Figure 1, wherein each subdivision octree covering a 3208320*40 data volume, Wilhelms);

determining a plurality of non-leaf node splats each corresponding to one of the plurality of non-leaf nodes that includes a portion of the isosurface, each of the plurality of non-leaf node splats based on a plurality of splats each corresponding to a lower hierarchical node (page 206, section 2.1, see paragraph, four, page 210, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 4.1, and page 205, section 2, wherein the vertices of polygons representing the portion of the isosurface within that cell Wilhelms); and

rendering a plurality of splats partially populating a splat hierarchy resulting from the determination of the pluralities of leaf node splats and non-leaf node splats (page 201, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, wherein the abstract is defined and page 205, section 2, wherein intersection points along cell edges are calculated and become vertices of polygons, Wilhelms).

Claim 2:

Regarding Claim 2, Wilhelms teaches wherein the hierarchical node data is 2-dimensional (page 204, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, third paragraph, wherein 3-dimensional data is the 3-d tree, wherein in its inheritance that a three dimensional includes a two dimensional, Wilhelms).

Claim 3:

Regarding Claim 3, Wilhelms teaches wherein the hierarchical node data is 3-dimensional (page 204, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, third paragraph, wherein 3-dimensional data is the 3-d tree, Wilhelms).

Claim 4:

Regarding Claim 4, Wilhelms eaches wherein the hierarchical node data is in octree format (page 206, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 3.1, wherein octree basic is defined and page 202, section 1.1, wherein octree have been used just to represent three-dimensional objects, and octrees have also been used just to represent the spatial relationship of geometrical objects, and wherein octree applications is used to represent some boolean property of the points in the volume, or some property for which most of the points take on a null value that is specified, Wilhelms).

Claim 5:

Regarding Claim 5, Wilhelms teaches wherein the hierarchical node data is in shared octree format (page 207, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, wherein a full octree is one in which each node has exactly eight children, wherein this is only possible only if the volume resolution is the same power of two in each dimension, e.g. 4*4*4 (64) samples and so forth, Wilhelms).

Claims 6, 27 and 37:

Regarding Claims 6 and 27, Wilhelms teaches wherein at least one of the pluralities of leaf node splats and non-leaf node splats are determined recursively (page 202, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 1.1, wherein octrees are three-dimensional extensions of quadtrees, where space is recursively subdivided into eight subvolumes, and the root of the octree refers to the entire volume, wherein in the normal case, each coordinate direction is divided in two, giving a "lower" half space and an "upper" half space, Wilhelms).

Claims 8 and 29:

Regarding Claims 8 and 29, Wilhelms teaches wherein the scalar data is representative of leaf node material occupancy percentages (page 216, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Table 1, Wilhelms).

Claim 9:

Regarding Claim 9, Wilhelms teaches wherein determining the plurality of leaf node splats includes approximating isosurface locations within at least one of the leaf nodes based on the scalar values (page 213, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 4.2, wherein each adding approximately s nodes, wherein the necessity of nodes with only two or four children on the deepest levels

of the tree produces the worst case, which is approximately $1/7s^3 + s^2$ nodes actually needed, compared with the optimum of about $1/7 (s + 1)^3$, Wilhelms).

Claim 10:

Regarding Claim 10, Wilhelms teaches wherein ones of the plurality of leaf node splats are each partially defined by a leaf node splat center that is an average of intermediate edge point locations wherein the intermediate edge points approximate a predetermined scalar value along an intersection between the isosurface and leaf node faces (page 206, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 2.1, wherein the octree is traversed with a particular threshold, only exploring those branches that contain part of the isosurface; any node whose maximum is below the threshold or whose minimum is above it is exited without traversing its children, wherein a leaf node that contains isosurface is visited, each of the, i.e. normally eight, cells that it "covers" are visited, and polygons are generated, wherein the table contains 256 entries, referring to the 256 combinations of positive and negative, i.e. relative to threshold values that can occur for an eight-cornered cell and each table entry describes which cell edges contain intersections and how they should be, page 215, under section 4.2, wherein as when two points are in the center of the volume, where the even-subdivision tree requires more visitation because the nodes are on separated subtrees of the root and page 216, section 6, wherein justifications for comparing the two methods on the surface-finding phases only are two: first, the octree can be precomputed and stored for reuse; second, it is possible to use the same octree for multiple thresholds, Wilhelms).

Claim 11:

Regarding Claim 11, Wilhelms teaches wherein ones of the plurality of leaf node splats are each partially defined by a leaf node splat normal that approximates an isosurface normal (pages 214-215, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, wherein the octree contains approximately ~s 2t

nodes and the binary tree approximately *t/s* nodes, wherein the effect of the binary tree is relatively negligible; the ratio of nodes to data points remains near # and the branch-on-need strategy normally produces a tree shaped quite differently from the even-subdivision version and the even-subdivision strategy will partition the volume into more equal parts, for example a one-dimensional example, if there are 65 data points, the even-subdivision strategy will divide at the top into one subtree covering 33 data points and another covering 32 and the branch-on-need strategy will divide into one region covering 64 data points and the other covering 1 point, Wilhelms).

Claim 12:

Regarding Claim 12, Wilhelms teaches wherein ones of the plurality of leaf node splats are each partially defined by a radius determined such that each of the of leaf node splats divides each corresponding leaf node into two portions (page 208, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, see section 3.4, Wilhelms).

Claim 15:

Regarding Claim 15, Wilhelms teaches wherein each of the plurality of non-leaf nodes splats is partially defined by a radius determined such that each of the of non-leaf node splats divides each corresponding non-leaf node into two portions (**REFER** to claim12, wherein the following limitation is substantially the same as claim 12, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Wilhelms).

Claim 16:

Regarding Claim 16, Wilhelms teaches wherein the radius of each of the plurality of non-leaf node splats is the minimum radius that permits the corresponding non-leaf node splat to divide the corresponding non-leaf node into two portions (**REFER** to claim 13, wherein this limitation is substantially the same as

claim 13, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Wilhelms).

Claim 17:

Regarding Claim 17, Wilhelms teaches wherein each of the plurality of non-leaf node splats is partially defined by a normal and a cone encompassing a plurality of lower hierarchy splat normals (Figure 5a & b, wherein a cone is interpreted to be cone-shaped mass of ovule- or spore-bearing scales or bracts, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Wilhelms).

Claims 22, 32 and 44:

Regarding Claims 22, 32 and 44, Wilhelms teaches wherein one of the visibility conditions is backface culling page 219, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Figure 5, Wilhelms).

Claims 23, 33 and 45:

Regarding Claims 23, 33 and 45, Wilhelms teaches wherein one of the visibility conditions is viewpoint frustum culling (page 213, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 4.2, paragraph 1 and 2, Wilhelms).

Claims 24, 34 and 46:

Regarding Claims 24, 34 and 46, Wilhelms teaches wherein one of the visibility conditions compares splat screen sizes to threshold values (page 216, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, wherein table 1 is illustrated, Wilhelms).

Claims 25, 35 and 47:

Regarding Claims 25, 35 and 47, Wilhelms teaches wherein the rendering means includes means for performing rendering recursively (**REFER** to claim 6, wherein this limitation is substantially the same as claim 6, and page 201, the abstract, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Wilhelms).

<u>Claims 36 and 42</u>:

Regarding Claims 36 and 42 discloses a program product utilizing the same functionality, wherein Wilhelms teaches a program product, comprising:

a computer-readable storage medium (page 206, section 3, wherein space requirements of an octree can be serious issued in the design of a system that will process large data volumes, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Wilhelms);

means recorded on the medium for providing hierarchical node data representing an object, the hierarchical node data including a lowest hierarchy level having a plurality of leaf nodes and a plurality of higher hierarchy levels each having a plurality of non-leaf nodes each encompassing ones of the plurality of leaf nodes (**<u>REFER</u>** to claim 1, wherein this limitation is substantially the same as defined in claim 1, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Wilhelms);

means recorded on the medium for determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes (**<u>REFER</u>** to claim 1, wherein this limitation is substantially the same as defined in claim 1, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Wilhelms); and

means recorded on the medium for determining a plurality of non-leaf node splats each corresponding to one of the plurality of non-leaf nodes that includes a portion of the isosurface, each of the plurality of non-leaf node splats based on a plurality of splats each corresponding to a lower hierarchical node (**<u>REFER</u>** to claim 1, wherein this limitation is substantially the same as defined in claim 1, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Wilhelms).

<u>Claim 51</u>:

Regarding Claim 51, Wilhelms teaches a method of extracting isosurface data from a scalar field, comprising:

providing scalar field data (page 216, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 6.1, Wilhelms); and

building a splat hierarchy (page 208, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 3.2, Wilhelms), including:

determining a plurality of leaf node splats each corresponding to one of the plurality of leaf nodes that includes a portion of an isosurface, each of the plurality of leaf node splats based on scalar data corresponding to at least one of the plurality of leaf nodes (page 209, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Figure 1, wherein each subdivision octree covering a 3208320*40 data volume, Wilhelms); and

determining a plurality of non-leaf node splats each based on a plurality of lower hierarchical splats (page 210, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, section 4.1, Wilhelms).

Claim Rejections – 35 U.S.C – 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 7, 18, 28, 39-41, and 48-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uppala (US Patent No. 6,279,007, Date of Patent: August 21, 2001) in view of Chang et al (Non-Patent Literature, ACM Special Interest Group on Computer Graphics and Interactive Techniques, 1999, hereinafter Chang).

Claims 7 and 28:

Regarding Claims 7 and 28, Uppala teaches wherein at least one of the pluralities of leaf node splats and non-leaf node splats are determined employing results matching (Figure 9D, diagrams 965, 967, 969, 973, Uppala).

Claim 18:

Regarding Claim 18, Uppala teaches compressing a splat hierarchy populated by the pluralities of leaf node splats and non-leaf node splats (columns 12-13, lines 59-67 and lines 1-19, Uppala).

Claims 39 and 48:

Regarding Claims 39 and 48, Uppala teaches wherein the storage medium is a magnetic recording medium (Figure 5, diagrams 28, 31 and 33, Uppala).

Claims 40 and 49:

Regarding Claims 40 and 49, Uppala teaches wherein the storage medium is an optical recording medium (Figure 5, diagrams 29, 30 and 34, Uppala).

Claims 41 and 50:

Regarding Claims 41 and 50, Uppala teaches wherein the storage medium is a network distribution medium (Figure 5, all features, Uppala).

Claim 13:

Uppala discloses all the limitations above. However, Uppala does not disclose the radius of each of the plurality of leaf node splats is the minimum radius that permits the corresponding leaf node splat to divide the corresponding leaf node into two portions. On the other hand, Chang discloses wherein the radius of each of the plurality of leaf node splats is the minimum radius that permits the corresponding leaf node splat to divide the corresponding leaf node into two portions (page 293, section 3.1, second column, wherein classify pixels in the LDI tree into two categories, un-filtered and filtered, Chang). It would have been obvious to one of the ordinary skill in the art at time of the invention to modify Uppala invention to include Chang invention for splatting operation and the complexity of optimization of rendering and non-rendering an object. A skilled artisan would have been motivated to do by extracting of the best samples for view to reduce rendering time.

Claim 14:

Regarding Claim 14, Uppala in view of Chang teaches wherein each of the plurality of non-leaf node splats is partially defined by a plane based on a least square fit of a plurality of lower hierarchical splats (page 292, section 3, second column, wherein a lower resolution results in more levels in the LDI tree, wherein the resolution of the LDI be 1*1 which makes the LDI tree resemble the volume data in the

hierarchical splatting and wherein for simplicity one face of the bounding box as the projection plane of the LDI, wherein the orthographic projection is used and the production direction is perpendicular to the projection plane, wherein a box is equivalent to a square, Chang).

Claim 19:

Regarding Claim 19, Uppala in view of Chang teaches wherein compressing includes replacing a plurality of substantially coplanar lower hierarchy splats with a combine splat substantially coplanar with the plurality of lower hierarchy splats (page 292, section 2.2, Chang et al), having a radius larger than the individual radius of the plurality of lower hierarchy splats, and having a splat cone substantially encompassing a plurality of children splat normals (page 292, section 3, wherein the LDI tree is an octree with and LDI attached to each octree cell, wherein each octree cell contains a bounding box and pointers to its eight children cells, Chang).

Claims 21, 31 and 43:

Regarding Claims 21, 31 and 43, Uppala in view of Chang teaches wherein the means for rendering the plurality of splats includes means for verifying that ones of the plurality of splats satisfy visibility conditions (page 291, section 1, wherein one 3D image warping is the disocclusion artifacts which are caused by the areas that are occluded in the original reference image but visible in the current view, Chang et al), wherein the splat hierarchy also includes a plurality of non-rendered splats (page 291, section 1, wherein both splatting and meshing are adequate for post-rendering warping in which current view does not deviate much from the view of the reference image and page 295, section 3.5, wherein our gap filling method produces different results from the meshing method described in Mark's Post-Rendering 3D Warping, wherein Figure 5 shows an example of the gap that is caused by a front surface occluding a back surface and in the meshing method, the gaps are covered by quadrilaterals stretching between the front

surface and the back surface, wherein in contrast, our gap filling method splats the filtered samples from surfaces that surround the gap in the output, Chang).

Prior Art of Record

1. Wilhelms et al. (Non-Patent Literature, ACM Transactions on Graphics, Vol. 11, No. 3, July 1992, Octrees for Faster Isosurface Generation).

2. Pratt (Non-Patent Literature, Computer Graphics, Volume 21, Number 4, July 1987, Direct least-squares fitting of algebraic surfaces, 1987).

3. Chang et al. (Non-Patent Literature, ACM Special Interest Group on Computer Graphics and Interactive Techniques, 1999).

4. Uppala (US Patent No. 6,279,007).

Point of Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Helene Rose whose telephone number is (571) 272-0749. The examiner can normally be reached on 8:00am - 4:30pm Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Wong can be reached on (571) 272-1834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Helene Rose
Technology Center 2100
June 23, 2006

ALFORD KINDRED
PRIMARY EXAMINER